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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11**  15th Meeting: Geneva, CH, 23 Oct. – 1 Nov. 2013 | Document: JCTVC-O0061 |

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| **Joint Collaborative Team on 3D Video Coding Extensions**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11**  6th Meeting: Geneva, CH, 25 Oct. – 1 Nov. 2013 | Document: JCT3V-F0038 |

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| *Title:* | **MV-HEVC/SHVC HLS: Alternative colPic indication** | | |
| *Status:* | Input Document to JCT-VC and JCT-3V | | |
| *Purpose:* | Proposal | | |
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# Abstract

The syntax, alt\_collocated\_indication\_flag and collocated\_ref\_layer\_idx, were removed due to possible low-level implementation changes and the lack of coding efficiency improvement ground. This proposal proposes an enhanced alternative indication mechanism which could produce short cut for motion only inter-layer picture without low-level changes and syntax changes. The alternative method could achieve bit saving up to 6 bits per slice (4 bits per slice if the length of RefPicList[] is 4), assuming that the motion only inter-layer picture is stored in the last position of RefPicList and selected for colPic.

# Introduction

An alternative mechanism specifying colPic using alt\_collocated\_indication\_flag and collocated\_ref\_layer\_idx was introduced for the usage of expected depth coding, where the colPic is likely to be located in the last position and the length of overhead of collocated\_ref\_idx is not small. But the syntax was removed, due to concerns for possible low-level implementation changes and the lack of coding efficiency improvement ground. However, since the usefulness of alternative indication mechanism continues to be valid, we’d like to propose an enhanced alternative indication mechanism.

Assuming that motion only inter-layer reference picture exists, it is very likely to be used for colPic indication and it is likely to be located at the end of reference picture list RefPicList[].

In that case, when the length of RefPicList[] is 5 (num\_ref\_idx\_l0\_active\_minus1 is 4), collocated\_ref\_idx is set to be 4 but it can be set equal to 0 if alternative collocated ref\_idx is used. The following table shows the bits saving per slice by this assumption. The bit saving per slice could be up to 6 bits.

|  |  |  |  |
| --- | --- | --- | --- |
| Length of RefPicList[] | collocated\_ref\_idx by conventional definition  [ref\_idx for RefPicListX] | collocated\_ref\_idx by proposed definition  [ref\_idx for MotionRefLayerId] | bits saving |
| 1 | 0 | 0 | 0 (1 bit – 1bit) |
| 2 | 1 | 0 | 2 (3 bit – 1bit) |
| 3 | 2 | 0 | 2 (3 bit – 1bit) |
| 4 | 3 | 0 | 4 (5 bit – 1bit) |
| 5 | 4 | 0 | 4 (5 bit – 1bit) |
| 6 | 5 | 0 | 4 (5 bit – 1bit) |
| 7 | 6 | 0 | 4 (5 bit – 1bit) |
| 8 | 7 | 0 | 6 (7 bit – 1bit) |
| 9 | 8 | 0 | 6 (7 bit – 1bit) |
| 10 | 9 | 0 | 6 (7 bit – 1bit) |
| 11 | 10 | 0 | 6 (7 bit – 1bit) |
| 12 | 11 | 0 | 6 (7 bit – 1bit) |
| 13 | 12 | 0 | 6 (7 bit – 1bit) |
| 14 | 13 | 0 | 6 (7 bit – 1bit) |
| 15 | 14 | 0 | 6 (7 bit – 1bit) |

Note: collocated\_ref\_idx is coded by ue(v). The following is ue(v)’s example.

Exp-Golomb bit strings and codeNum in explicit form and used as ue(v) (informative)

|  |  |
| --- | --- |
| **Bit string** | **codeNum** |
| 1 | 0 |
| 0 1 0 | 1 |
| 0 1 1 | 2 |
| 0 0 1 0 0 | 3 |
| 0 0 1 0 1 | 4 |
| 0 0 1 1 0 | 5 |
| 0 0 1 1 1 | 6 |
| 0 0 0 1 0 0 0 | 7 |
| 0 0 0 1 0 0 1 | 8 |
| 0 0 0 1 0 1 0 | 9 |
| 0 0 0 1 0 1 1 | 10 |
| 0 0 0 1 1 0 0 | 11 |
| 0 0 0 1 1 0 1 | 12 |
| 0 0 0 1 1 1 0 | 13 |
| 0 0 0 1 1 1 1 | 14 |
| … | … |

# Proposal

In this proposal, if motion only inter-layer picture exists in active inter-layer prediction layer RefPicLayerId, the motion only inter-layer picture list is generated as MotionRefLayerId [] and the collocated\_ref\_idx is interpreted as the index to MotionRefLayerId []. That means MotionRefLayerId [collocated\_ref\_idx] indicates the colPic. To avoid low-level implication change, the collocated\_ref\_idx is re-derived at slice / picture level. Specific algorism can be described as follows.

When collocated\_from\_l0\_flag is 1,

Search RefPicList0[i] for which nuh\_layer\_id equals to MotionRefPicLayerId [collocated\_ref\_idx] for i in the range of 0.. num\_ref\_idx\_l0\_active\_minus1. If such i is found, collocated\_ref\_idx is set equal to i.

Otherwise

Search RefPicList1[i] for which nah\_layer\_id is MotionRefPicLayerId [collocated\_ref\_idx], where i is in the range of 0.. num\_ref\_idx\_l1\_active\_minus1. If such i is found, collocated\_ref\_idx is set equal to i.

If not found, collocated\_ref\_idx is not changed.

# Text changes

The variables RefPicLayerId[ i ], MotionRefPicLayerId[ i ] and NumActiveMotionRefLayerPics for all values of i in the range of 0 to NumActiveRefLayerPics − 1, inclusive, are derived as follows:

for( i = 0, j = 0; i < NumActiveRefLayerPics; i++; j++) {

RefPicLayerId[ i ] = RefLayerId[ nuh\_layer\_id ][ inter\_layer\_pred\_layer\_idc[ i ] ]

if (!MotionPredEnabledFlag[ nuh\_layer\_id ][ RefPicLayerId[ i ] ] && MotionPredEnabledFlag[ nuh\_layer\_id ][ RefPicLayerId[ i ] ] )

MotionRefPicLayerId[ j ] = RefPicLayerId[ i ]

}

NumActiveMotionRefLayerPics = j

|  |  |
| --- | --- |
| slice\_segment\_header( ) { | Descriptor |
| … |  |
| if( slice\_type = = P | | slice\_type = = B ) { |  |
| … |  |
| if( slice\_temporal\_mvp\_enabled\_flag ) { |  |
| if( slice\_type = = B ) |  |
| collocated\_from\_l0\_flag | u(1) |
| if( ( collocated\_from\_l0\_flag && num\_ref\_idx\_l0\_active\_minus1 > 0 ) | |  ( !collocated\_from\_l0\_flag && num\_ref\_idx\_l1\_active\_minus1 > 0 ) ) |  |
| collocated\_ref\_idx | ue(v) |
| } |  |

**collocated\_ref\_idx** specifies the reference index of the collocated picture used for temporal motion vector prediction or the reference index to a list of the motion reference layer id MotionRefLayerId.

When slice\_type is equal to P or when slice\_type is equal to B and collocated\_from\_l0 is equal to 1, collocated\_ref\_idx refers to a picture in list 0, and the value of collocated\_ref\_idx shall be in the range of 0 to num\_ref\_idx\_l0\_active\_minus1, inclusive.

When slice\_type is equal to B and collocated\_from\_l0 is equal to 0, collocated\_ref\_idx refers to a picture in list 1, and the value of collocated\_ref\_idx shall be in the range of 0 to num\_ref\_idx\_l1\_active\_minus1, inclusive.

It is a requirement of bitstream conformance that the picture referred to by collocated\_ref\_idx shall be the same for all slices of a coded picture.

If NumActiveMotionRefLayerPics is greater than 0, the following apply:

found = 0  
 if (collocated\_from\_l0\_flag == 1 && collocated\_ref\_idx < NumActiveMotionRefLayerPics)

{

for( i = 0; i <= num\_ref\_idx\_l0\_active\_minus1 && !found; i++) {

if (MotionRefPicLayerId [collocated\_ref\_idx] == nuh\_layer\_id of RefPicList0[ i ] ) {

collocated\_ref\_idx = i

found = 1

}

}

}

else if (collocated\_from\_l0\_flag == 0 && collocated\_ref\_idx < NumActiveMotionRefLayerPics)

{

for( i = 0; i <= num\_ref\_idx\_l1\_active\_minus1 && !found; i++) {

if (MotionRefPicLayerId [collocated\_ref\_idx] == nuh\_layer\_id of RefPicList1[ i ] ) {

collocated\_ref\_idx = i

found = 1

}

}

}

# Conclusion

It is proposed an alternative method to indicate colPic where collocated\_ref\_idx is interpreted as the index for motion only reference picture list and converted into the index of normal reference picture index. Because it is beneficial to reduce slice level signalling and there are no impact for syntax and low level colPic derivation process, it is recommended to adopt the proposal in MV-HEVC and SHVC.

# Reference

[1] V. Seregin, Y.-K. Wang, Y. Chen, MV-HEVC/SHVC HLS: On collocated picture indication and inter\_layer\_sample\_pred\_only\_flag, JCTVC-N0107

# Patent rights declaration(s)

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